



|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 1, 2019/2020

**TOS1141 OPERATING SYSTEMS**  
(All Sections / Groups)

16<sup>th</sup> October 2019  
2:30 p.m. – 4:30 p.m.  
(2 Hours)

---

### INSTRUCTION TO STUDENTS

1. This paper consists of 4 pages with FIVE (5) questions only.
2. Attempt ALL questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.

**QUESTION 1**

- a) Explain the process of the computer system's startup, starting from the bootstrap program. (2 marks)
- b) Describe the concept of *clustered systems*. (2 marks)
- c) One of the popular OS structures used was the *microkernel*. Describe the *microkernel* system structure. (4 marks)
- d) Peterson's solution can be used to solve the *critical section* problem.
  - i) Explain why Peterson's solution has *mutual exclusion*. (1 mark)
  - ii) Explain why Peterson's solution has *progress*. (1 mark)

---

**Continued...**

**QUESTION 2**

- a) Cooperating processes need inter-process communication (IPC). Two models of IPC are *shared memory* and *message passing*.
- i) Provide **TWO (2)** advantages of shared memory model. (2 marks)
- ii) Provide **TWO (2)** disadvantages of shared memory model. (2 marks)
- b) Consider the following processes with the length of a CPU burst time given in milliseconds and the arrival times as follows:

| process | arrival time | priority | burst time |
|---------|--------------|----------|------------|
| p0      | 0            | 1        | 2          |
| p1      | 0            | 2        | 5          |
| p2      | 2            | 4        | 4          |
| p3      | 4            | 3        | 1          |
| p4      | 5            | 7        | 6          |
| p5      | 6            | 1        | 2          |

- i) Draw the Gantt chart illustrating the execution of those processes using Shortest Job First scheduling *without preemption*. (1 mark)
- ii) Draw the Gantt chart illustrating the execution of those processes using Shortest Job First scheduling *with preemption*. (1 mark)
- iii) Calculate the average waiting time for Shortest Job First scheduling *without preemption*. (2 marks)
- iv) Calculate the average waiting time for Shortest Job First scheduling *with preemption*. (2 marks)

**Continued...**

**QUESTION 3**

- a) Given a file in Linux with permission string “-rw-rw-r--”. State the mode of access for the *owner*, *group* and *public* of the file. (3 marks)
- b) Describe any TWO (2) file attributes in a computer’s file system. (2 marks)
- c) Consider the following snapshot of a system with FIVE processes (P0, P1, P2, P3, P4) and FOUR resource types (A, B, C, D):

|    | Allocation |   |   |   | Max |   |   |   | Available |   |   |   |
|----|------------|---|---|---|-----|---|---|---|-----------|---|---|---|
|    | A          | B | C | D | A   | B | C | D | A         | B | C | D |
| P0 | 1          | 0 | 2 | 2 | 1   | 0 | 4 | 2 | 1         | 1 | 2 | 0 |
| P1 | 1          | 0 | 1 | 0 | 5   | 3 | 3 | 1 |           |   |   |   |
| P2 | 0          | 3 | 0 | 0 | 2   | 4 | 1 | 0 |           |   |   |   |
| P3 | 0          | 0 | 0 | 0 | 1   | 3 | 0 | 1 |           |   |   |   |
| P4 | 3          | 0 | 0 | 0 | 4   | 3 | 2 | 1 |           |   |   |   |

- i) Construct the *Need* matrix. (2 marks)
- ii) Using the *Banker’s Algorithm*, demonstrate all the steps required to show whether the system is in a safe state or not. Show all the required steps. (3 marks)

**Continued...**

**QUESTION 4**

- a) Consider a memory with a contiguous allocation scheme consisting of 4 partitions of 500K, 300K, 400K, and 200K respectively.

Given a set of processes with 150K, 270K, 370K, and 400 K (in this order), allocate them into the memory:

- i) Using *first fit* algorithm.

(3 marks)

- ii) Using *best fit* algorithm.

(3 marks)

- b) The operating system is responsible for using the disk drives efficiently, this means having a fast access time and large disk bandwidth.

Name and explain any **TWO (2)** algorithms used for disk scheduling.

(4 marks)

**QUESTION 5**

- a) Consider the following page reference string:

|    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 2 | 3 | 8 | 2 | 6 | 3 | 4 | 2 | 3 | 2 | 1 | 3 | 4 | 6 | 4 | 3 | 5 | 4 | 3 |
|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Assume a paging scheme with **THREE (3)** frames initially empty. Trace the allocation of pages to frames and find the number of page faults using the following page replacement algorithms:

- i) First In First Out

(3 marks)

- ii) Least Recently Used

(3 marks)

- b) Explain *thrashing* in virtual memory. Explain the cause of *thrashing*.

(2 marks)

- c) State **TWO (2)** possible ways to solve thrashing.

(2 marks)

**End of Paper**